REMARKS/ARGUMENTS

These remarks are made in response to the Office Action of September 17, 2004 (Office Action), in which claims 1-43 and 46-49 under 35 U.S.C. § 102(b) were rejected as being anticipated by U.S. Patent No. 5,719,997 to Brown, *et al.* (Brown).

Applicant has amended the title to conform to the Examiner's remarks. Applicant has also renumbered each of the claims following Claim 43 to correct the claim numbering to also conform to the Examiner's remarks. Applicant has amended independent Claims 43 and renumbered Claim 48 to further clarify certain features of Applicant's invention. The amendments are fully supported in Applicant's Specification at, for example, pages 15-17 and 23. No new matter has been added by virtue of these amendments. As this response is timely filed within the three-month statutory period, no fee is believed due.

I. Applicant's Invention

Before addressing the art cited by the Examiner, it may be helpful to briefly review certain features of Applicant's invention. The Applicant's invention concerns a method and a system for including grammars in a statistical parser for use with a natural language understanding (NLU) system. The method, for example, includes receiving a text input and applying a first context-free grammar (CFG) to the text input so as to determine substrings and corresponding parse trees. The substrings and corresponding parse trees can correspond to the first CFG. Each substring can be examined using an

inventory of queries corresponding to the first CFG. Alternately, each substring can be examined using one or more features each having a corresponding weight which is determined during training of the NLU system.

According to Applicant's invention, queries can be used, for example, to make determinations such as the following regarding any possible substring and parse tree associated with a portion of text:

- Is a word of text contained within a non-terminal of a particular CFG?
- Does the word begin a substring in the set of parses found by the CFG?

(See, Applicant's specification, pp. 15-16.) A response to one query can render others moot, while alternately rendering others more pertinent. Queries and/or features, moreover, can be directed at CFG terminals within non-terminals so as to determine whether any of the following situations obtain with respect to a portion of text:

- Does a word begin a substring that can be parsed by the grammar?
- Does the word continue a substring that can be parsed by the grammar and continue an open constituent already started?
- Does the word continue a substring that can be parsed by the grammar and close an open constituent already started?
- Does a current constituent just created continue a current open one?

(See Applicant's Specification, p.23.)

One advantage of using such queries or features as taught by Applicant's invention is that their use provides a mechanism for guiding or enhancing in an NLU system a statistical parser based either on decisions trees or the maximum entropy principle. This allows for smaller, more specific grammars for particular constituents or word groupings, which, in turn, can reduce the amount of training data and time needed to train an NLU system. (See, e.g., Applicant's Specification, pp. 16-17.) The use of queries and/or features as taught by Applicant's invention can be used to train the statistical system during a training phase before it is instantiated for real-time parsing of phrases identified by the CFG. (Applicant's Specification, p. 16.)

II. U.S. Patent 5,719,997 to Brown

Brown not teach or inherently possess every feature of Applicant's for invention. Indeed, Brown is not even concerned with the problems addressed by Applicant's invention. Brown, for example, is not directed to the training of an NLU. Brown is explicitly directed to recognizing "connected input by instantiating a grammar in real time." (Col. 3, lines 23-25.) In particular, Brown is concerned with real-time instantiation and de-instantiation of "ephemeral models" such as an "ephemeral" Hidden Markov Models (EHMM). The real-time instantiation is intended to reduce hardware-based memory requirements by "selectively creating and destroying portions of [a] grammar instantiation." (Col. 2, lines 34-48; Col. 3, lines 23-34.) Real-time creations

and destructions of a grammar do not relate to the training, guiding or enhancing of a statistical parser in an NLU system as taught by Applicant's invention.

Not surprisingly, Brown does not disclose or even suggest either the use of an inventory of queries or the use of features corresponding to a CFG, as taught by Applicants' invention. The Examiner points to Brown's reference to "[a] table of grammar node scores" that is "updated at each frame [of speech]," but this is not at all similar to the queries or features corresponding to a CFG as in Applicant's invention.

The scores in Brown do not correspond to a CFG or other grammar, but rather to the segments of speech that are cumulatively scored at discrete points during a speech processing event. (Col. 5, lines 15-23, 55-65; FIG 2 and FIG. 3.) To understand the node scores of Brown, it is necessary to understand how they are constructed and applied. Brown processes speech input by creating "phrase paths" comprising a serial concatenation of arcs" in accordance with a grammar. (Col. 4, line 64 – Col. 5, line 6.) An output hypothesis score is generated for the arcs at each node to which one or more arcs is connected. (Col. 5, lines 15-55; FIG. 2). Segments of the speech input are sequentially examined and, at each successive node, the scores are cumulated with previously examined ones. This process culminates in a score each alternative phrase path corresponding to a speech input. (Col. 6, lines 50-55; FIG. 3.) The table of scores is generated by selecting the largest hypothesis score for each node. (Col. 6, lines 53-55.)

It is important to note that, in connection with the table of node scores, Brown does not disclose or suggest the use of features or an inventory of queries as taught by Applicant's invention. More fundamentally, the scores themselves do not correspond to a CFG, or other grammar; they correspond to arcs along a phrase path. The critical difference between Brown's scores and both the features and inventory of queries of Applicant's invention is apparent from the different functions performed by the features and inventory of queries corresponding to a CFG.

For example, the scores provide no mechanism for guiding or enhancing a statistical parser based either on decision trees or the maximum entropy principle. Nor do the scores provide for smaller, more specific grammars for particular constituents or word groupings. Accordingly, the scores in Brown also can not be used to reduce the amount of training data and time needed to train an NLU system, as discussed at pages 16-17 of the Applicant's Specification, for example. Moreover, the scores can not train a statistical system during a training phase: the scores are expressly applied during a real time speech processing event.

CONCLUSION

Applicant respectfully maintains that Brown fails to disclose every feature of Applicant's invention. For example, as detailed above, Brown fails to teach or suggest a system or method that includes the application of features or an inventory of queries

corresponding to a CFG, as taught by Applicant's invention and recited in each of independent Claims 1, 16, 20, 24, and 39, as well as amended independent Claims 43 and 48.

Additionally, Applicant respectfully emphasizes that in addition to not teaching or inherently possessing each aspect of the claimed invention, Brown fails to contemplate the claimed invention, as can be easily discerned from the above remarks. For example, Brown does not solve the same problems that Applicant's invention does, nor would the Applicants' claimed invention be obvious to one of ordinary skill in the art in light of Brown or other known techniques and methodologies that existed at the time of Applicant's invention. There would be no reason, other than the Applicant's disclosure, for one of ordinary skill in the art to derive teachings similar to the Applicant's claimed invention based upon Brown.

Accordingly, the prior art fails to provide a basis for rejecting each of independent Claims 1, 16, 20, 24, and 39 as well as amended independent Claims 43 and 48. The prior art also fails to provide a basis for rejecting the dependent claims since each recites yet additional features over those set forth in the independent claims from which each depends. Applicants, therefore, respectfully request that the Examiner's rejections be withdrawn.

Applicants believe that this application is now in full condition for allowance, which action is respectfully requested. Applicants request that the Examiner call the

undersigned if clarification is needed on any matter within this Amendment, or if the Examiner believes a telephone interview would expedite the prosecution of the subject application to completion.

Respectfully submitted,

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